

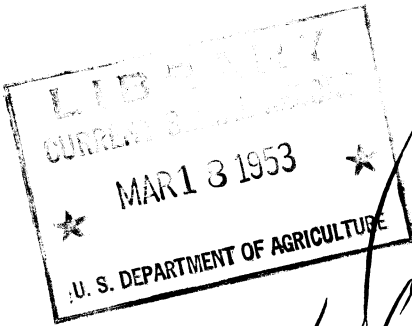
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THE WHEAT STRAWWORM AND ITS

Control



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THE WHEAT STRAWWORM AND ITS CONTROL

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ECONOMIC IMPORTANCE

THROUGHOUT the wheat-growing States east of the Mississippi River the annual depredations of the wheat strawworm (*Harmolita grandis*) are ordinarily exceeded only by those of the hessian fly (*Phytophaga destructor*) and the wheat jointworm (*H. tritici*), and in certain areas it often exceeds either or both in destructiveness. In other wheat-growing regions also it is an important pest.

This insect causes losses ranging from slight injury to total destruction of the crop, depending upon its

abundance. A serious outbreak in Kansas one year caused a loss estimated between 10 and 15 million bushels of wheat. The species is usually present in considerable numbers, and its populations can increase rapidly. Even when it is very abundant and destructive, its presence may be readily overlooked, and the damage that it does may be ascribed to other causes. Therefore, in order to repress this pest, control measures should receive constant attention.

WHEAT THE ONLY FOOD PLANT

Unlike many important insect pests, the wheat strawworm apparently has only one food plant,

¹ Retired.

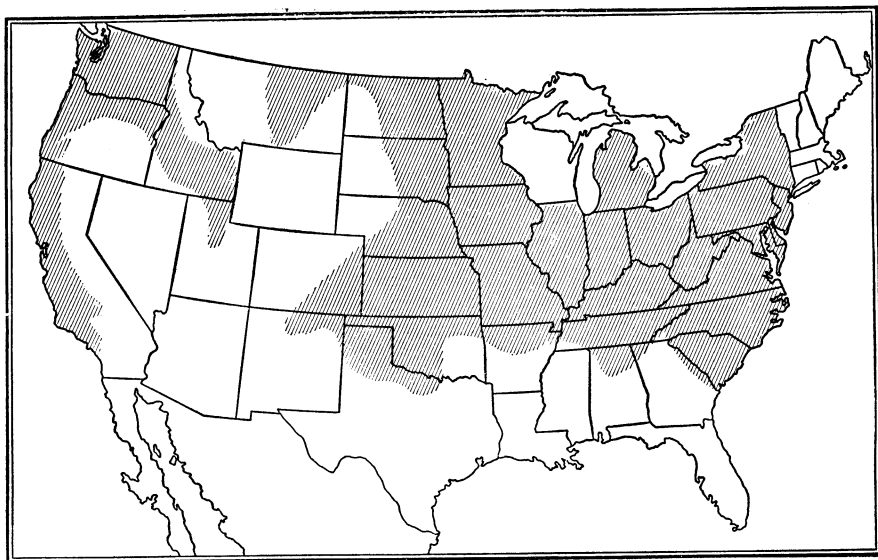


FIGURE 1.—Distribution of the wheat strawworm in the United States.

wheat. It lays eggs in several other plants, such as barley, oats, rye, and several grasses, but the larvae are unable to complete their development in any but wheat.

DISTRIBUTION

The wheat strawworm undoubtedly occurs throughout the regions of the United States where wheat is grown regularly from year to year. The accompanying map (fig. 1) indicates the States from which it has been recorded by various observers.

CHARACTER OF INJURY

The wheat strawworm has two generations each year. Early in

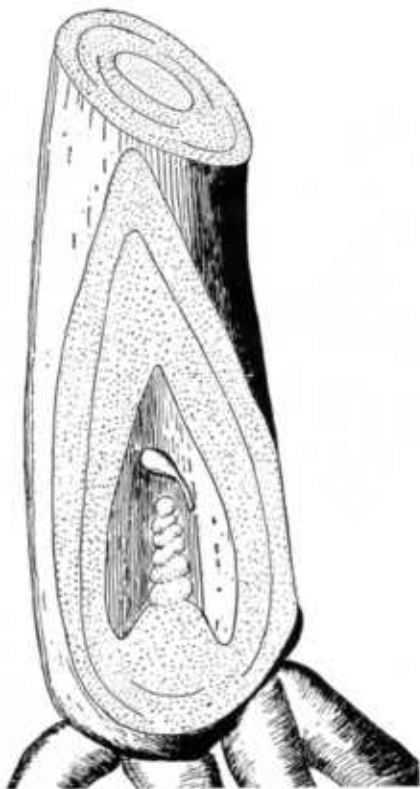


FIGURE 2.—Diagrammatic drawing of young wheat plant, showing embryonic wheat head near which the eggs of the first-generation strawworm are deposited. Note the egg within the envelope that surrounds the tender head.

the spring the adult or parent insect of the first generation deposits its eggs in or near the embryonic wheat head (fig. 2) when the young wheat plants extend only a few inches above the ground. The larva, or grub, develops within and near the base of the plant, destroying the tiller or the entire plant where this plant has not previously tillered. Thus all tillers infested by the spring form of this pest are prevented from producing any grain and become a total loss.

The infested tillers resemble those infested with the hessian fly in that the central shoots do not develop and the leaves have the same dark-green color.

As the larva completes its development, the tiller usually becomes bulblike at the point of infestation (fig. 3), where the larva occupies a



FIGURE 3.—Left, young wheat plant, with a healthy tiller. Right, a tiller infested by the spring form of the wheat strawworm; note the absence of the central shoot and the bulblike appearance of the stem near the base. About natural size.

cavity that it has eaten out in the embryonic head.

The injury to wheat caused by the second generation is less severe except where spring wheat is attacked. The adult deposits its eggs in winter wheat just above the youngest and most succulent joints, usually after the plant has headed and is in bloom. The larva sucks the juice of the tender plant and develops rapidly in the center of the stem (fig. 4), or sometimes in



FIGURE 4.—Full-grown larva of the summer form of the wheat strawworm in its cell in a wheat stem.

the wall of the stem before the straw has hardened. The stems of winter wheat are not killed, and in fact show no external evidence of injury, but the yield of grain is reduced sometimes as much as 22 percent, and it is of poorer quality. In Kansas damage has been reduced by growing early varieties of wheat.

LIFE HISTORY

The two generations of the wheat strawworm do not resemble each other very closely. They are designated as the spring form (*minuta*)

and the summer form (*grandis*) (fig. 5).

Each form passes through four stages of development—the egg, the larva or grub, the pupa or resting stage, and the adult or parent insect.

The adults of the spring form are minute, shiny black insects closely resembling ants, usually without wings. If wings are present, they are rarely fully developed. The legs have light-yellowish bands at the knees. These adults, which are nearly all females, emerge in March and April in the Eastern and Central States; in Washington State emergence occurs in April, and in Arizona it takes place during the latter part of January and continues through February. The females deposit their eggs in young wheat plants, in or very near the embryonic wheat head (fig. 2). The egg is white and nearly transparent, pear-shaped, and has a short, thick pedicel which is slightly curved. In about 10 days the larva hatches from the egg and totally destroys the embryonic head within the plant, usually causing a slight enlargement of the stem (fig. 3) at the point of infestation. The cavity thus formed in the crown of the plant is occupied by the larva after it has completed its feeding. This larva becomes more robust than the summer form, perhaps because it feeds on the most nutritious part of the plant. It is of a light straw color, has brown jaws, and when full-grown is 0.17 inch long. Full growth is reached in about 27 days, and the pupal stage then begins. At first the pupa is the same color as the larva but later it changes to a shiny jet black (fig. 6). The pupal stage lasts about 12 days, after which the fully developed adult of the summer form gnaws a circular hole through the wall of the stem and comes out.

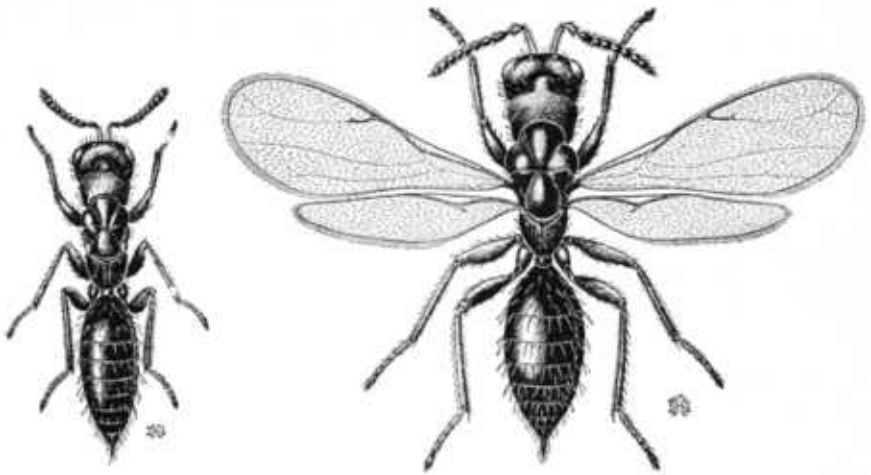


FIGURE 5.—Adult wheat strawworms: Left, spring form; right, summer form. Greatly enlarged. (After Knowlton.)

The adults of the summer form are much larger and more vigorous than those of the spring form.



FIGURE 6.—Pupa of the spring form of the wheat strawworm in its cell in old wheat straw.

They have fully developed wings, which they use to great advantage in dispersing throughout fields adjacent to their place of develop-

ment. They are strong flyers and with the aid of favorable winds they fly considerable distances.

No males have been found among the adults of the summer form, and the females reproduce without mating. They emerge in May and June in most of the wheat-growing regions and deposit eggs singly in the growing wheat plant slightly above the upper joints about the time the internodes begin to elongate rapidly. Winter wheat is heading at about this time. The two upper joints are usually preferred for oviposition, although every joint may be infested. Often the eggs are placed directly in the cavity of the stem or culm, but they may be placed in the wall of the stem. They hatch in from 5 to 5½ days. Normally only one larva is found at a joint. Where more than one larva is present, one may usually be found in the center of the stem, just above the joint, and the others in the wall. The larvae lacerate the inner walls of the stems, where they suck the rich plant juices and develop rapidly. They attain full growth before the plant tissues have hardened or else perish. The

full-grown larvae of the summer form resemble in color those of the spring form, but are long and slender and not so robust. They form neat cells within or near the joints (fig. 4) and remain there to enter the pupal stage (fig. 6) in the fall. No change occurs until early in the spring, when they develop into adults of the spring form and gnaw their way out, to continue their life cycle.

NATURAL ENEMIES

The wheat strawworm has a number of parasitic and predaceous enemies which help to keep down losses from this pest. A very small mite, *Pediculoides ventricosus*, destroys the larva in the stem. It gains access to the larval cells that become ruptured during harvesting and threshing. Unfortunately it does not confine itself to the larva of the strawworm but devours beneficial parasites as well.

One of the most important parasites of the wheat strawworm is *Eupelma allynii*. As many as 22 percent of the strawworms in wheat stems collected in Virginia have been parasitized by this species. This parasite has a brilliant greenish-black body and yellow legs. In the southern half of the United States it has four or more generations each year.

Three parasites of similar appearance—*Ditropinotus aureoviridis*, *Merisus febriculosus*, and *Eridontomerus isosomatis*—have yellow abdomens and metallic-colored bodies. Each of these parasites has two or more generations a year.

Another parasite, *Merisoporos chalcidiphagus*, has five generations each year in the southern half of the United States. This species in the adult stage is bluish black. Another parasite of potential importance, *Calosota metallica*, is restricted to the Pacific coast and

Rocky Mountain regions. It seems to be widely distributed in California, where it has more than one generation annually.

All these parasites are four-winged wasps and are of about the same size as the adult strawworm. Unfortunately they cannot be depended upon to control this insect.

CONTROL MEASURES

Since the wheat strawworm lives only on wheat, an effective control measure is to avoid growing this crop within 65 to 75 yards of wheat straw or stubble of the previous season. The spring form, being practically wingless, cannot travel great distances to infest young wheat and thus continue the life cycle. Where wheat is planted adjoining wheat stubble or straw stacks of the previous season, the infestation caused by this form is greatest within 30 yards of the edge of the field, bordering the old wheat straw. The infestation may reach twice this distance, especially where the prevailing winds are favorable to the migration of the pest.

In Virginia it has been found that wheat can safely follow wheat on the same land if all stubble is plowed under after harvest and the land sown to cowpeas, which in turn are disked into the soil in time for sowing the wheat in the fall.

In regions where spring wheat is grown to the exclusion of winter wheat, volunteer plants provide the only places in which the adults of the spring form can lay their eggs, since the egg-laying period of this form is over before any spring-sown wheat is up. From these volunteer plants, if not destroyed, emerge the adults of the summer or winged form, which lay their eggs in the spring wheat and may cause considerable loss to the crop.

In localities where the wheat strawworm is injurious, wheat

should not be top-dressed with manure containing unrotted straw infested with this insect.

Strawstacks are a greater source of infestation to growing wheat than is usually supposed. In com-

munities where the wheat straw-worm is very abundant, volunteer wheat around the strawstacks should be destroyed early in the spring before the first generation develops.